Monolithic Dual SPST CMOS Analog Switch

FEATURES

- ±15 V Input Signal Range
- 44-V Maximum Supply Ranges
- On-Resistance: 45 Ω
- TTL and CMOS Compatibility

BENEFITS

- Wide Dynamic Range
- Simple Interfacing
- Reduced External Component Count

APPLICATIONS

- Servo Control Switching
- Programmable Gain Amplifiers
- Audio Switching
- Programmable Filters

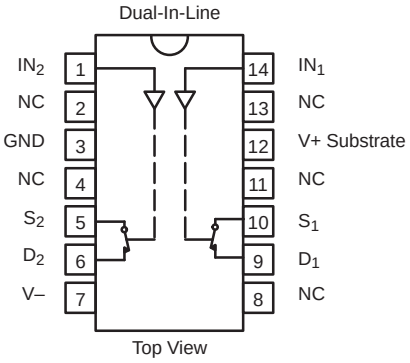
DESCRIPTION

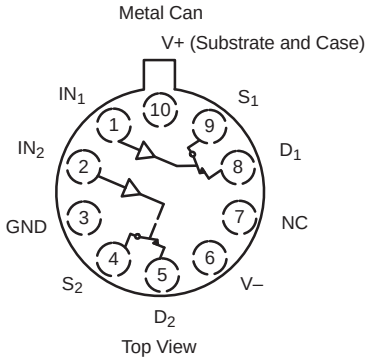
The DG200A_MIL is a dual, single-pole, single-throw analog switch designed to provide general purpose switching of analog signals. This device is ideally suited for designs requiring a wide analog voltage range coupled with low on-resistance.

The DG200A_MIL is designed on Vishay Siliconix' improved PLUS-40 CMOS process. An epitaxial layer prevents latchup.

Each switch conducts equally well in both directions when on, and blocks up to 30 V peak-to-peak when off. In the on condition, this bi-directional switch introduces no offset voltage of its own.

FUNCTIONAL BLOCK DIAGRAM AND PIN CONFIGURATION





TRUTH TABLE	
Logic	**Switch**
0	ON
1	OFF

Logic "0" ≤ 0.8 V
Logic "1" ≥ 2.4 V

ORDERING INFORMATION		
Temp Range	**Package**	**Part Number**
–55 to 125°C	14-Pin CerDIP	DG200AAK
		DG200AAK/883, JM38510/12301BCA, 5962-9562901QCA
	10-Pin Metal Can	DG200AAA
		DG200AAA/883, JM38510/12301BIC
	14-Pin Sidebraze	JM38510/12301BCC

ABSOLUTE MAXIMUM RATINGS

V+ to V– . . . . . 44 V
GND to V– . . . . . 25 V
Digital Inputs[a], V_S, V_D . . . . . (V–) –2 V to (V+) +2 V or 30 mA, whichever occurs first
Current (Any Terminal) Continuous . . . . . 30 mA
Current S or D
(Pulsed at 1 ms, 10% Duty Cycle Max) . . . . . 100 mA
Storage Temperature . . . . . –65 to 150°C

Power Dissipation (Package)[b]
10-Pin Metal Can[c] . . . . . 450 mW
14-Pin CerDIP[d] . . . . . 825 mW

Notes:
a. Signals on S_X, D_X, or IN_X exceeding V+ or V– will be clamped by internal diodes. Limit forward diode current to maximum current ratings.
b. All leads welded or soldered to PC Board.
c. Derate 6 mW/°C above 75°C
d. Derate 11 mW/°C above 75°C

SCHEMATIC DIAGRAM (TYPICAL CHANNEL)

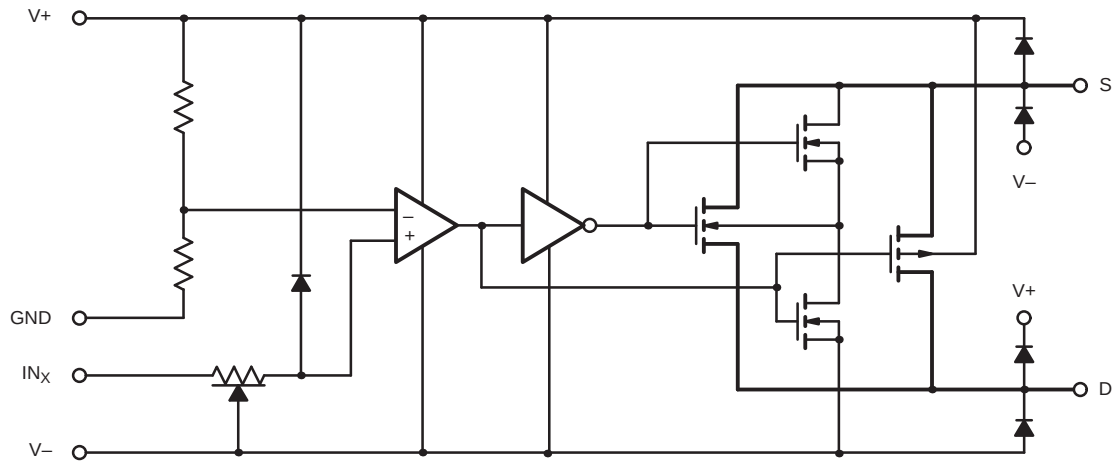


FIGURE 1.

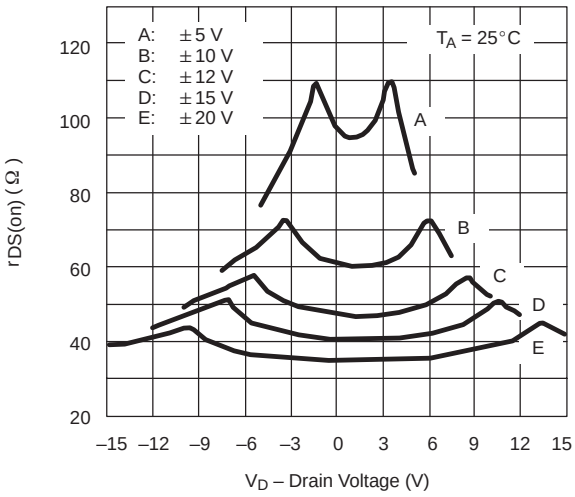
SPECIFICATIONS[a]

Parameter	Symbol	Test Conditions Unless Otherwise Specified V+ = 15 V, V– = –15 V V_{IN} = 2.4 V, 0.8 V[f]		Temp[b]	Limits –55 to 125°C Min[c]	Typ[d]	Max[c]	Unit
Analog Switch								
Analog Signal Range[e]	V_{ANALOG}			Full	–15		15	V
Drain-Source On-Resistance	$r_{DS(on)}$	V_D = ±10 V, I_S = –1 mA		Room Full		45	70 100	Ω
Source Off Leakage Current	$I_{S(off)}$	V_S = ±14 V, V_D = ∓14 V		Room Full	–2 –100	±0.01	2 100	nA
Drain Off Leakage Current	$I_{D(off)}$	V_D = ±14 V, V_S = ∓14 V		Room Full	–2 –100	±0.01	2 100	
Channel On Leakage Current[f]	$I_{D(on)}$	V_S = V_D = ±14 V		Room Full	–2 –200	±0.1	2 200	
Digital Control								
Input Current with Input Voltage High	I_{INH}	V_{IN} = 2.4 V		Room Full	–0.5 –1	0.0009		µA
		V_{IN} = 15 V		Room Full		0.005	0.5 1	
Input Current with Input Voltage Low	I_{INL}	V_{IN} = 0 V		Room Full	–0.5 –1	–0.0015		
Dynamic Characteristics								
Turn-On Time	t_{ON}	See Switching Time Test Circuit		Room		440	1000	ns
Turn-Off Time	t_{OFF}			Room		340	425	
Charge Injection	Q	C_L = 1000 pF, V_g = 0 V R_g = 0 Ω		Room		–10		pC
Source-Off Capacitance	$C_{S(off)}$	f = 140 kHz V_{IN} = 5 V	V_S = 0 V	Room		9		pF
Drain-Off Capacitance	$C_{D(off)}$		V_D = 0 V	Room		9		
Channel-On Capacitance	$C_{D(on)}$ + $C_{S(On)}$	V_D = V_S = 0 V, V_{IN} = 0 V		Room		25		
Off Isolation	OIRR	V_{IN} = 5 V, R_L = 75 Ω V_S = 2 V, f = 1 MHz		Room		75		dB
Crosstalk (Channel-to-Channel)	X_{TALK}			Room		90		
Power Supplies								
Positive Supply Current	I+	Both Channels On or Off V_{IN} = 0 V and 2.4 V		Room		0.8	2	mA
Negative Supply Current	I–			Room	–1	–0.23		

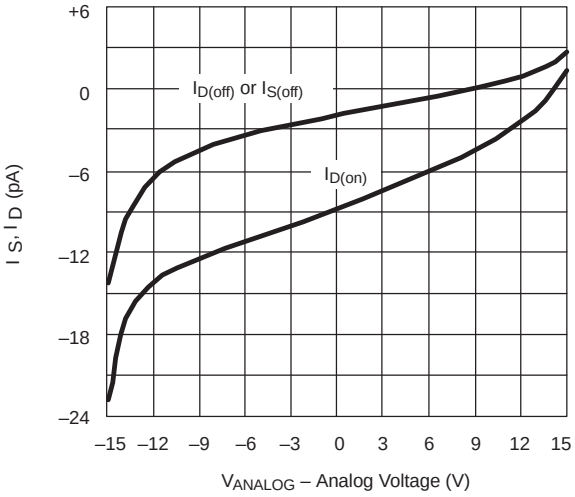
Notes:
a. Refer to PROCESS OPTION FLOWCHART.
b. Room = 25°C, Full = as determined by the operating temperature suffix.
c. The algebraic convention whereby the most negative value is aminimum and the most positive a maximum, is used in this data sheet.
d. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
e. Guaranteed by design, not subject to production test.
f. V_{IN} = input voltage to perform proper function.

TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

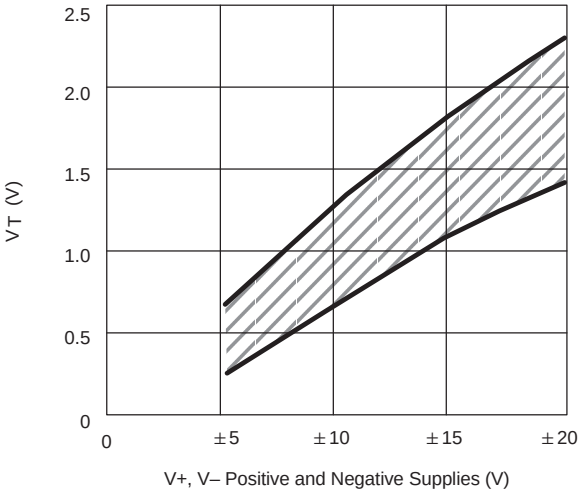
$r_{DS(on)}$ vs. V_D and Power Supply Voltage



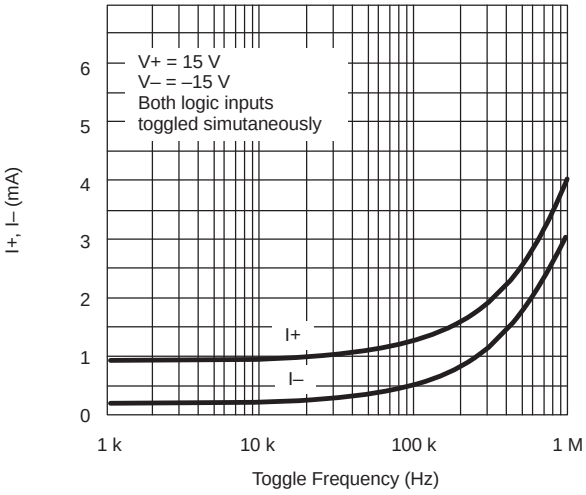
Leakage Currents vs. Analog Voltage



Input Switching Threshold vs. V+ and V– Supply Voltages



Supply Currents vs. Toggle Frequency



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TEST CIRCUITS

V_O is the steady state output with switch on. Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.

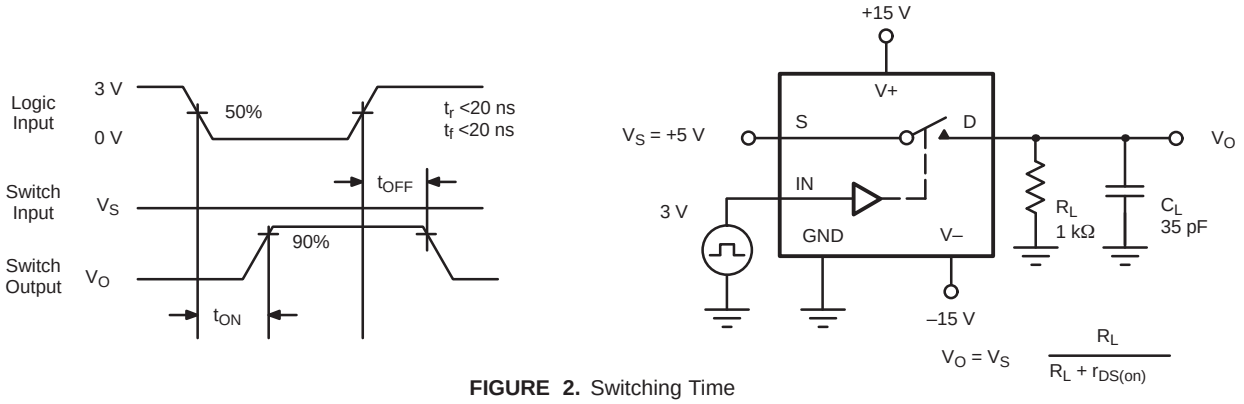

FIGURE 2. Switching Time

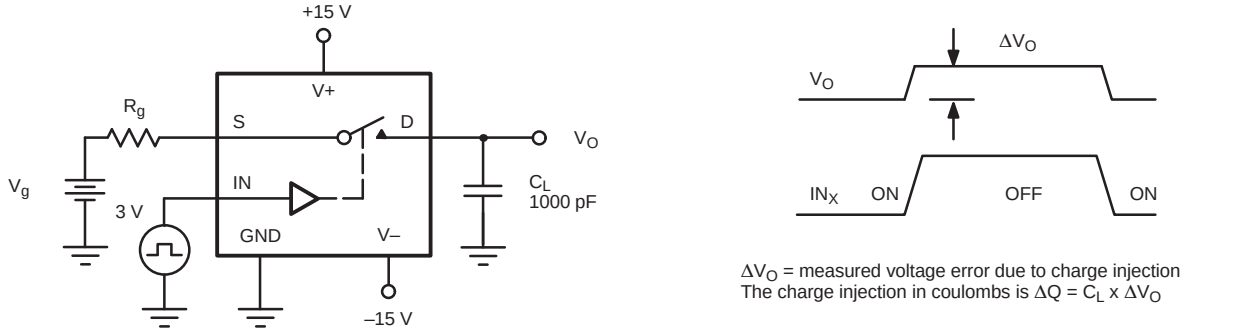

FIGURE 3. Charge Injection

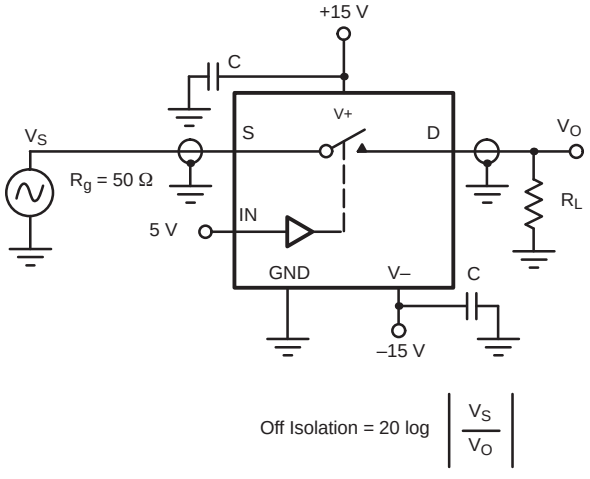

FIGURE 4. Off Isolation

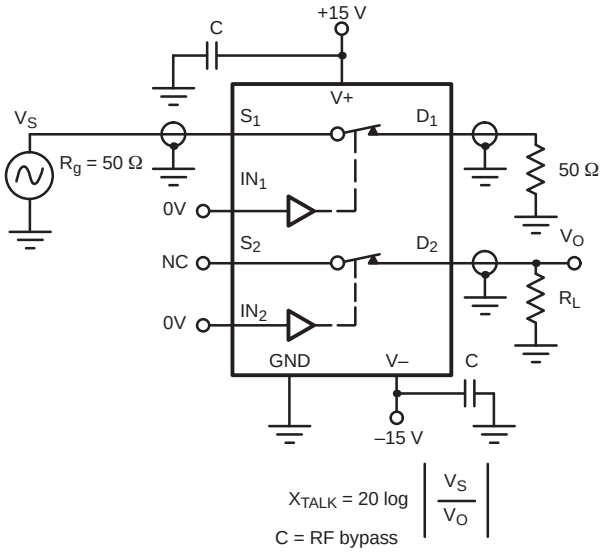

FIGURE 5. Channel-to-Channel Crosstalk

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